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Stress-Testing Croatian Households with Debt

Implications for Financial Stability

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Abstract

The purpose of this paper is to stress test the resilience of Croatian households with debt to economic shocks. The shocks not only impact a household's welfare, but also increase the probability of loan default. As a result, there is a direct link between these stress-testing exercises and financial stability risks. The authors find that very few households are at risk as a result of the shocks experienced over the past few years; new vulnerable households represent about 2 percent of all households, 6 percent of households with debt, and 2–3 percent of aggregate banking system assets. This suggests that household over-indebtedness in Croatia is unlikely to become a drag on aggregate economic activity and that financial stability risks remain manageable. One caveat should be noted. Some 27–31 percent of households with debt, representing 8–9 of banking system assets, are vulnerable even before being subjected to an economic shock. Since NPLs were low before the global financial crisis, it can be argued that banks knew something about some of these households that is not captured by household budget surveys. It follows that the calculations in this paper should primarily focus on the increased vulnerability of households as a result of shocks and are likely to represent an upper bound to the financial stability risks faced by Croatia on account of household indebtedness.

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Stress-Testing Croatian Households with Debt—Implications for Financial Stability

by

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Stress-Testing Croatian Households with Debt—Implications for Financial Stability[1]

This paper assesses the financial stability risks that arise from the high debt levels accumulated by Croatian households in the pre-crisis period. As opposed to relying on banking sector data, this paper puts forward a methodology that uses household budget surveys (HBS). In particular, the vulnerability of indebted households to changes in economic conditions is explored. This includes shocks that impact only some households (or household members), such as the loss of income that arises as a result of becoming unemployed, as well as shocks that arise from changes to the terms in which loans have been extended. The latter includes changes in exchange rates and their impact on the debt service of foreign currency (or foreign currency linked) loans and changes in interest rates and their impact on the debt service of variable interest rate loans. The effect of these shocks on households' vulnerability depends not only on the size of the shocks simulated, but also on the risk thresholds that are used to tag a household as vulnerable.

The use of HBS has limitations. To begin, they cover only a small subset of all households—0.2 percent. But the sampling methodology involved limits the concerns that arise from small samples. Another limitation is that the coverage of these surveys has some weak aspects. For example, while incomes, expenditures and household characteristics are covered in detail, information on financial assets is largely absent. But these limitations should be gauged against the alternative; namely, detailed loan-by-loan borrower information is lacking in macroeconomic data and this also hampers a thorough assessment of household vulnerability. Also, the lack of data on the stocks of household financial assets suggests that the risks identified in this paper are likely to be upper bounds to concerns about household over-indebtedness and its potential implications for financial stability. Finally, the use of HBS allows a distinction between households with and without debt and the characteristics of those that do hold debt, thus enabling an assessment of the impact of debt on aggregate economic activity (Albacete and Fessler, 2010).

The vulnerability exercises carried out highlight that low income households are particularly vulnerable. However, the financial distress of these households appears to precede the economic shocks that Croatian households might be going through as a result of the global financial crisis—what this paper refers to as *risk loans at origination*. The economic shocks, be these through increased unemployment, changes in interest rates, or changes in exchange rates appear to have limited additionality in terms of new vulnerable households. That so many households are at risk at loan origination raises questions as to what banks know about their borrowers that is not captured in Croatia's HBS—a subject to which the paper devotes some attention. The primary focus of this paper is, however, the impact of plausible crisis-related economic shocks on financial stability; i.e., new vulnerable households.

A second conclusion is that household debt is concentrated in few households and largely in upper income quintiles. In part this is because credit growth took place from low levels and was brought to an abrupt and early end by the financial crisis. For example, only 7 percent of all households in Croatia have mortgage debt; the equivalent figure for France, Germany, the UK,

[1] This paper was prepared as background to a forthcoming World Bank (2011) report titled "Golden Growth: Restoring the Lustre of the European Economic Model." The views expressed are exclusively those of the authors and do not necessarily represent the views of the World Bank or the Executive Directors and the governments they represent. We wish to thank Sanja Madzarevic-Sujster for bringing to our attention the features of the Croatian HBS that serve to explain the high level of risk loans at origination, thus necessitating a distinction between level and change regarding household debt at risk. We also appreciate the comments received from Evan Kraft and Peter Mooslechner. Of course all remaining errors are our exclusive responsibility.

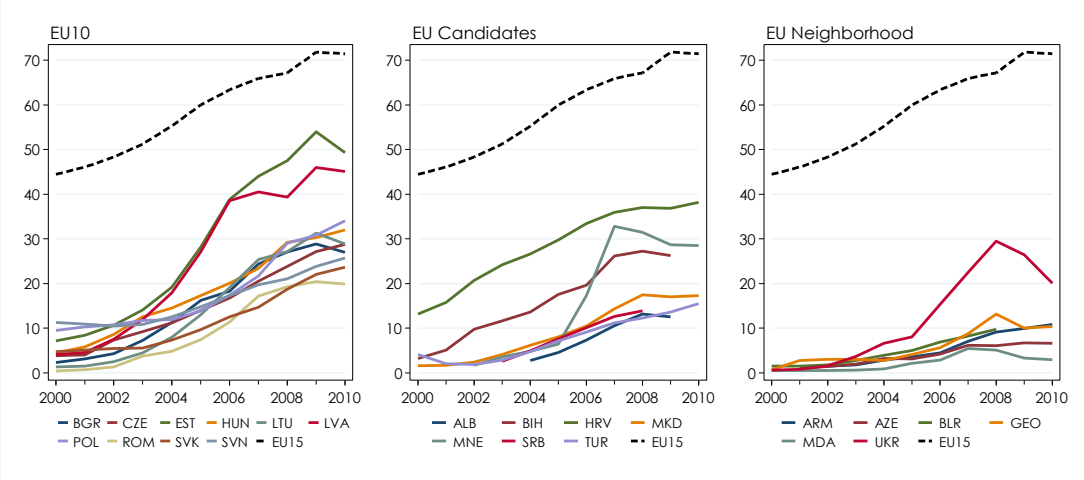
Sweden and Italy averages 40 percent (EBRD and World Bank, 2011). Since in the worst case only 1 of every 10 households faces financial distress, this is unlikely to result in a drag on aggregate economic activity. Moreover, two-thirds of these households are at *risk at loan origination* and, as discussed later, this results in an upward bias on household vulnerability.

On the whole, the risks to financial stability arising from household debt appear to be manageable despite Croatia's large increase in household debt in the years preceding the financial crisis. To reach this conclusion, this paper begins by describing household debt developments over the past decade. It then presents a methodology to tag indebted households as vulnerable to financial distress and further stress tests the balance sheets of households to changes in economic conditions. The implications for financial stability are then discussed by assessing the impact of household debt problems on banks' loan portfolio. Conclusions follow.

Developments in Household Debt

Figure 1 shows developments in total household debt in the European region.[2] Worth noting is that household debt is, as would be expected, below the average for richer EU15 countries. Interestingly, debt levels are in line with those observed in the United States when this country had similar incomes per capita (in real PPP terms; household debt in the US was also about 25-30 percent of GDP in the early 1960s). There are a few exceptions. Over-leveraged household balance sheets appear to be likely in Estonia, Latvia, and Croatia, and perhaps also in Montenegro, Bosnia and Herzegovina, and Ukraine; the last three countries mostly on account of their lower income levels. Although it would be best to benchmark household debt after controlling for country-specific structural characteristics, this is not possible owing to the lack of a long time series; thus the focus here only on income per capita comparisons as opposed to a benchmarking of household debt based on country-specific structural characteristics.

Figure 1. Household Indebtedness across Emerging Europe (% GDP)

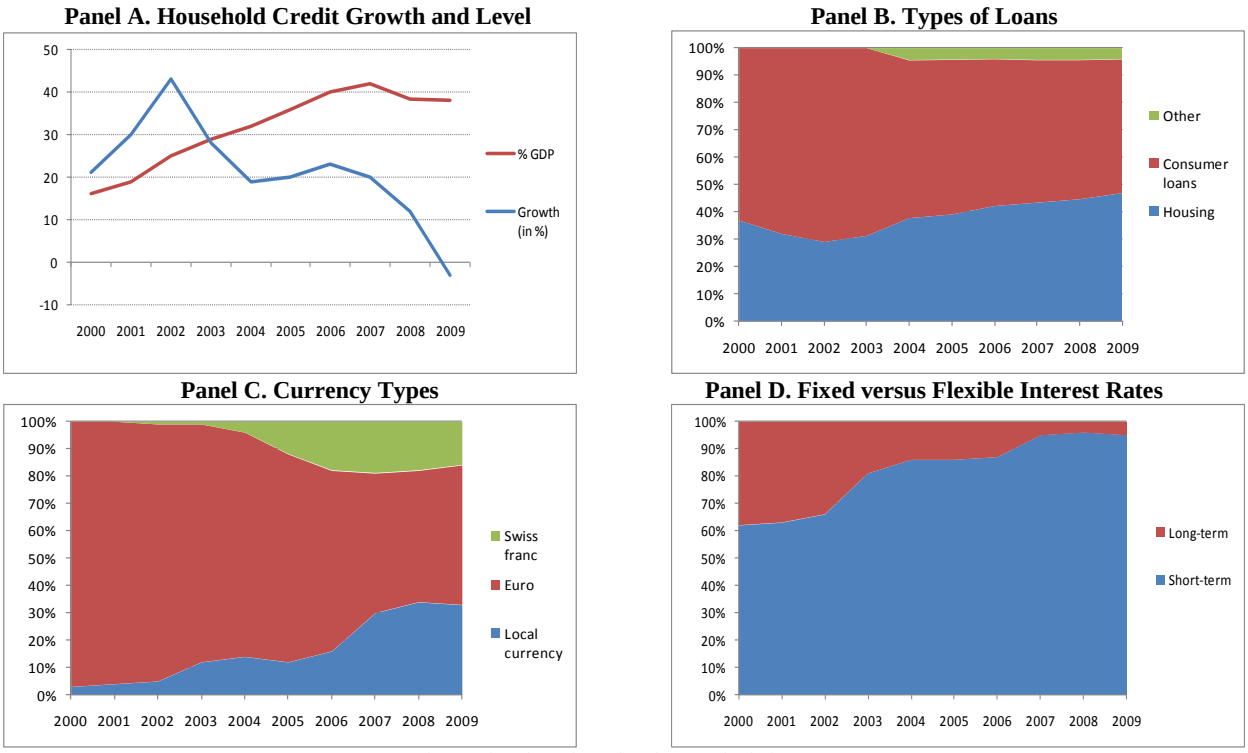


Source: EBRD Structural Change Indicators, European Credit Research Institute, and authors' calculations. Note: Includes all types of household debt.

[2] EU15 includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom. EU10 includes Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia. The candidate countries comprise the rest of the Balkans (Albania, Bosnia and Herzegovina, Croatia, Kosovo, FYR Macedonia, Montenegro, Serbia, and Turkey. The EU neighborhood covers Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine.

The charts in Figure 2 provide a detailed account of developments in household debt. Four features are worth noting. First, albeit from low levels, Croatia experienced high credit growth in the decade preceding the global financial crisis (Panel A). Second, a large share of this increase was in the form of housing-related loans (Panel B). Third, most household debt in Croatia is linked to foreign currency (Panel C).[3] Finally, most loans are extended at variable interest rates and this makes households vulnerable to changes in banks' funding costs (Panel D).[4]

Figure 2. Household Debt Characteristics in Croatia



Source: European Credit Research Institute, Croatian National Bank, and authors' calculations.

Data and Methodology[5]

The primary purpose of the paper is to stress test the capacity of households to service their debt obligations. To this end, indebted households are exposed to different types of economic shocks. The shocks not only impact households' welfare, but also increase the probability of loan default. Thus, there is a direct link between these stress-testing exercises and Croatia's financial stability risks. The rest of this section describes the data and stress-testing methodology.

[3] Initial conditions have a bearing on interest differentials. Mitra, Selowsky, and Zalduendo (2009) argue that cross-country differences in currency composition are explained by interest rate differentials that in turn reflect differences in initial conditions.
[4] The average distribution between flexible and fixed interest rate mortgages is, respectively, 90 and 10 percent. While the effect of changes in interest rates might be mitigated by caps on interest rate adjustments, information on caps is not available.
[5] An important caveat should be raised. The assessment of household welfare in response to economic shocks is approached as a partial equilibrium exercise; i.e., changes in household behavior are disregarded and a general equilibrium framework is absent. The methodology on stress testing household debt holdings and on assessing the share of vulnerable households follows Holló (2007), Żochowski and Zajączkowski (2008), Johansson and Persson (2006), Vatne (2006), and Tiongson et al. (2010).

Data

Croatia's 2008 household budget survey contains information on household debt service obligations. In particular, there is a distinction between principal and interest payments. Also of interest is the information contained on income and household characteristics, such as socio-economic status and educational level of household members, the composition of individual households, and information on sources of income for each household member. This detailed household information can be used to assess the income effect of unemployment that might affect one or more members in the household and to calculate household-specific subsistence consumption levels. The information is collected from a total of 3,108 households and, by using the sample weights, more than 1.4 million households in the country are represented in the survey. The HBS 2008 also has a section on household indebtedness. Specifically, households are asked, first, whether or not they have made payments on housing loans and other types of loans over the past 12 months and then, if they have, they are asked to provide the information on loan amounts, payment amounts and the number of installments.[6] The survey includes information on interest payments on mortgages and other loans. At the analytical stage in this paper, all the relevant calculations are adjusted by the corresponding sample weights.

While the use of household budget surveys has numerous advantages, its coverage on loan characteristics is largely absent. For example, there is no information on the currency of existing debts; nor is there any information on the type of interest rates (variable or fixed) in which loans have been extended. To circumvent these limitations, the methodology followed in this paper relies on central bank data on aggregate loan characteristics to define the distribution of household debt between (i) domestic and foreign currency loans and (ii) variable and fixed interest rate loans. The same data source is used to assess changes in interest rates and exchange rates. The weights are determined by aggregate central bank data and the shocks that households are exposed to are incorporated using random sampling techniques; the methodology is described in the next section. Also, the unemployment data reported by the statistical office and the same random sampling techniques are used to assess a household's vulnerability to income shocks.

Shocks and Vulnerability

To carry out vulnerability exercises, two factors must be taken into account: the type and size of the economic shocks to which households are exposed and the criteria that should be used to tag a household as vulnerable; the same criteria is used both before and after an economic shock.[7]

Regarding economic shocks, four different types of shocks are explored: (i) an increase in the interest paid on loans issued with variable interest rates, (ii) a devaluation of the exchange rate that impacts debt service on foreign currency denominated (or foreign currency indexed) loans,

[6] In the 2008 HBS, there are very few cases where information on loan amounts is missing. As to income data, only five households do not report current income components, but they nevertheless do not belong to the cluster of households with debt holdings. For a comprehensive description of the 2008 HBS refer to Croatian Bureau of Statistics (2010).

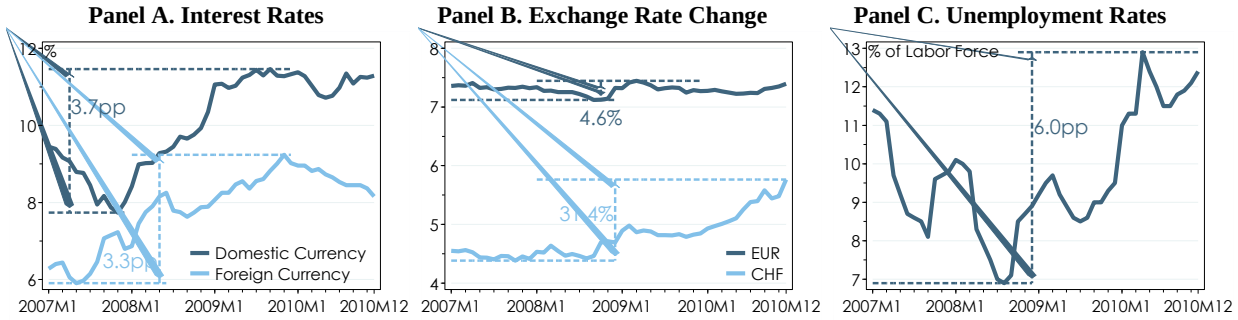
[7] The shock simulation for HBS data includes, following Beer and Schürz (2007), an arbitrary threshold on total debt service—this paper uses a 35 percent threshold. The shocks are applied as does in existing literature, such as Holló (2007), Żochowski and Zajączkowski (2008), Johansson and Persson (2006), and Vatne (2006).

(iii) an increase in the unemployment rate and thus a resulting loss in household income, and (iv) a scenario that combines these three shocks as independent events.[8]

How is the size of individual shocks chosen? One could either set ad-hoc shocks or benchmark these based on a country's own recent developments. With one exception, the latter approach is chosen; namely, the largest change in 2007-10 is calculated to specify the shocks to which households might be exposed—a change of 3.7 (domestic currency loans) and 3.3 (foreign currency loans) percentage points in variable interest rate loans, a change in the kuna-euro exchange rate of 4.6 percent and in the kuna-Swiss franc exchange rate of 31.4 percent, and an increase in unemployment of 6.0 percentage points (Figure 3). The rationale behind the choice of the largest changes and depreciation over the period is that, as mentioned in the introduction, the paper tries to reveal the maximum possible impact on households' abilities to repay their debt.[9] In addition to the benchmark shocks based on the country's developments, the impact of an arbitrary devaluation of 35 percent in the kuna-foreign currency rate is also explored. This arbitrary shock is calibrated using the experience of banking crises countries (Laeven and Valencia, 2008).

As to the thresholds used to tag a household as vulnerable, two approaches are possible: an arbitrary threshold or a financial margin threshold. The arbitrary threshold is measured as total debt service payments as a percent of disposable income and is calibrated based on work for advanced economies carried out by Johansson and Persson (2006). Specifically, this paper sets 35 percent as the threshold beyond which a household is considered to be vulnerable even though, a priori, households with high incomes should be able to devote a larger share of their income to debt service while maintaining subsistence consumption levels.[10]

Figure 3. Size of Shocks in Croatia



Source: Croatian National Bank, Croatian Bureau of Statistics, and authors' calculations.

[8] As opposed to modeling unemployment based on an individual's characteristics, it is assumed that the change in unemployment randomly affects employed household members. An alternative is to model the likelihood of becoming unemployed based on the characteristics of household members; to simplify the presentation, however, this alternative is not pursued.

[9] It should be noted that, as in Figure 3, the period of time used to define the magnitude of each shock is different. This makes it difficult to compare the results across different scenarios; in fact, the probability of the individual shocks being considered is different. For example, it took a few months for an increase in the kuna-euro exchange rate of 4,6 percent, but the increase in the CHF-euro exchange rate of 31,4 percent took several years. In this regards, it would be more accurate to use shock variables defined in terms of standard deviations. But, as noted before, the goal is to consider the largest possible economic shock.

[10] No doubt rich households might have higher consumption needs. The point, however, is that they are also more likely to be able to service their debts without falling into poverty.

To circumvent the problems that arise from applying a threshold without regard to a household's income, the alternative is to use a financial margin (FM) threshold. The FM is defined as

$$FM_j = DI_j - BLC_j - DSE_j \ ,$$

where *DI* and *BLC* are, respectively, disposable income and the basic living costs of household *j*, and *DSE* is their debt service expenditure. A household is considered at risk if the financial margin is negative.[11]

But how is the *BLC* calculated? Two options are possible. The first option is to use the data provided by statistical offices on subsistence consumption levels and apply this to each household using the composition characteristics of individual households. Specifically, subsistence consumption is adapted to each household using an equivalized household size, which is the sum of the first adult plus 0.5 times the number of other adults in the household plus 0.3 times the number of children, where adults are defined as people aged 14 years old and over and children are those aged 13 years old and younger. The *BLC* is calculated on a annual basis and per person, and is converted into annual household *j* expenditures by

$$BLC_j = BLC \cdot EQ_j$$

and where *EQ* is the equivalized household size in household *j*. The other option is to estimate *BLC* for all households in the HBS using an equation given by

$$\ln(BLC^*) = \beta_0 + \beta_1 DI + \beta_2 (A-1) + \beta_3 C + \beta_4 R + e$$

and where *BLC** is drawn from the HBS questionnaire (i.e., households are asked what is the minimum income they need), *DI* is household disposable income, *A* and *C* are the number of adults and children in each household, and *R* is an indicator variable that distinguishes between urban and non-urban regions; this is to control for regional differences in price levels. The third term on the right-hand-side is defined as β_2 (*A*-1) and captures household adults other than the head of household; the constant in the estimated equation captures the head of household effect. While this econometric estimation was pursued, it did not materially change the paper's conclusions; thus, to ease the exposition, this methodology is not discussed in this paper.

Stress-Testing Households

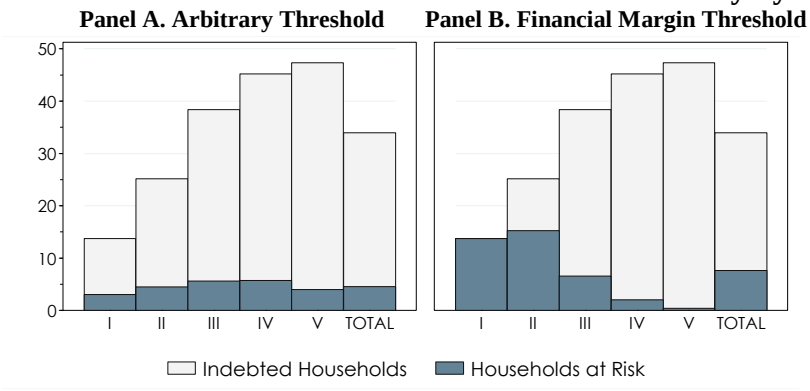
In assessing household financial distress, the first step is to assess a household's vulnerability before exposing it to economic shocks. Figure 4 shows the households that have debt in each income quintile and tags households with debt as vulnerable (the dark blue columns) using the two definitions of risk described earlier: an arbitrary threshold and a financial margin threshold.

Three findings are worth noting. First, only 1 out of 3 households have debt; i.e., 34 percent of all households have some type of debt, the last non-blue colored columns in each panel of Figure 4. In other words, debt is not as widespread as in advanced economies. Second, debt is more common among upper income quintiles; i.e., 14 percent of households in the lowest quintile have

[11] Households can be at risk (i.e., vulnerable) even though they do not have debt (i.e., disposable income below basic living costs). But since the interest of this paper is to examine indebtedness, only households with debt can be tagged as vulnerable.

debt compared to 47 percent of households in the highest quintile. Finally, only 4.6 to 7.6 percent of all households are at risk before a shock (i.e., the last dark blue column in each panel of Figure 4). The low levels of vulnerable households, as well as the low levels of debt incidence, suggest that household debt is unlikely to become a drag on aggregate economic activity.

Figure 4. Distribution of Household Debt and Household Vulnerability by Income Quintile



Source: Croatia HBS and authors' calculations.

It should be noted that the financial margin threshold makes most households in low income quintiles vulnerable. Do banks know something about their borrowers that is not captured in HBS? One can speculate as to possible explanations. A non comprehensive list includes banks' knowledge about informal sources of income and assets. Kraft (2007) highlights other factors that make household lending less risky, including informal incomes originating in family ties with Croatians living abroad the traditionally stringent banking lending conditions (e.g., co-debtor or guarantor requirements). This also points to weaknesses in Croatia's HBS that are thoroughly discussed in World Bank (2010). In particular, the original HBS sample was framed following the 2001 population census, but consistency checks carried out in recent years using macro data point to an underestimation over time in incomes and consumption expenditures. As a result, household vulnerability in the financial margin threshold calculations would be biased upwards as subsistence consumption levels are imposed on a sample of underestimated incomes. To a lesser degree, this upward bias is also present when arbitrary thresholds are used to tag household as vulnerable. But the problems with the HBS represent a bias only for the initial level of vulnerability; this is less of a concern once, as is the case in this paper, the focus is on changes in vulnerability as a result of economic shocks among households with debt.

The characteristics of indebted and vulnerable household groups are presented in Appendix Table. The table looks at mean values of several household-level indicators while distinguishing according to the vulnerability status of households—vulnerable versus non-vulnerable. Figure 4 already suggests that household vulnerability is more evenly distributed across income quintiles than is the case when the financial margin threshold is used to tag households as vulnerable. With the arbitrary threshold, where the distinction between vulnerable and non-vulnerable (i.e., simply indebted) households is less stark, *t*-tests suggest that only the mean values on household income (and its sources) and savings—and marginally the household responses on living standards—are not equivalent across vulnerability status. Characteristics on head of household and on the possession of durable goods do not show a statistically significant difference between vulnerable and non-vulnerable households. By contrast, with the financial margin threshold, almost all the mean value indicators of vulnerable households are statistically lower than those of

non-vulnerable households. For example, a head of household in the vulnerable group tends to be less skilled and less educated, which is consistent to the fact that the financial margin threshold has a bias to tag households as vulnerable in the lower income quintiles. Also, the share of households that possess durable goods is likely to be higher among households in the non-vulnerable cluster (i.e., more likely to be present in upper income quintiles) than is the case for vulnerable counterparts; the exception are widely-used home appliances (TV and refrigerators). Finally, when households with and without debt are compared, the former seem to have higher income and expenditure levels, reflecting the concentration of debt among rich households. Similarly, the possession of durable goods is higher and heads of households among those households that have debt are more likely to be educated, higher-skilled and younger.

Shocks Based on 2007-10 Developments

The next step is to estimate the effect on household vulnerability of exogenous economic shocks. These results are derived using the median value across households of 1,000 random draws in which households are subjected to the shocks in Figure 3. The random sampling approach is justified by the fact that loan information on currency composition (foreign and local currency loans) and interest rates (variable and fixed interest rate loans) comes from non-HBS sources. Also, some household-specific information is unknown; e.g., there is no way of knowing which household members become unemployed. In other words, random sampling techniques are used to define which households are impacted by each of the economic shocks being modeled.

In addition, as previously noted, the magnitude of the economic shocks could be arbitrarily set or linked to a country's own historical experience. With one exception, a country's own experience is chosen to define the size of economic shocks; i.e., the shocks reported in Figure 3 are used.

- In the case of an interest rate shock, households with variable interest loans are randomly selected using aggregate figures on the share of variable interest loans and then, once chosen, the random selection is exercised again to decide in which currency, local or foreign, are these loans denominated.[12] Households are subjected to a 3.7 and a 3.3 percentage point increase in the interest rate of domestic currency and foreign currency loans, respectively.

- In the case of an exchange rate shock, the selection of households is also based on aggregate figures on currency distribution in household loans. Like the interest rate shock, a two-stage selection is employed. First indebted households are randomly classified into foreign or local currency loan holders and, if chosen in the former category, the currency of their loans is decided based also on aggregate shares in the currency composition of household loans. More precisely, there are two types of shocks: a depreciation of 4.6 percent in the kuna-euro exchange rate and a depreciation of 31.4 percent in the kuna-Swiss franc exchange rate. The small change in the kuna- euro exchange rate reflects Croatia's regime choice.

- In the case of an unemployment shock, it is assumed that a household member might become jobless. The draw is at the level of each individual, which is then mapped to its own

[12] Since joint information on loan types with respect to both interest rates and currency is not available, the paper exercises the random selection twice as described; this could potentially mis-specify the simulation. Still, given that almost all household loans are based on short-term interest rates (Figure 2.D) and that the magnitudes of foreign- and local-currency interest rates are evenly distributed between these options (Figure 3.A), it is still safe to view these shocks as independent events.

household (i.e., more than one person might become unemployed in the same household). Those eligible for becoming jobless are currently employed, though farmers on their own farm and unpaid family workers are excluded from the draw. The economically inactive population (e.g., children and pensioners) is also excluded. The simulated shock is equal to a 6 percentage point increase in the unemployment rate.

As households are subjected to these shocks, this affects either their income or the burden of debt obligations. In all cases, the debt service burden is recalculated and then compared to the relevant vulnerability threshold. As already noted, all three types of stress-testing exercises are carried out 1,000 times and in each round the median of vulnerable households is calculated.

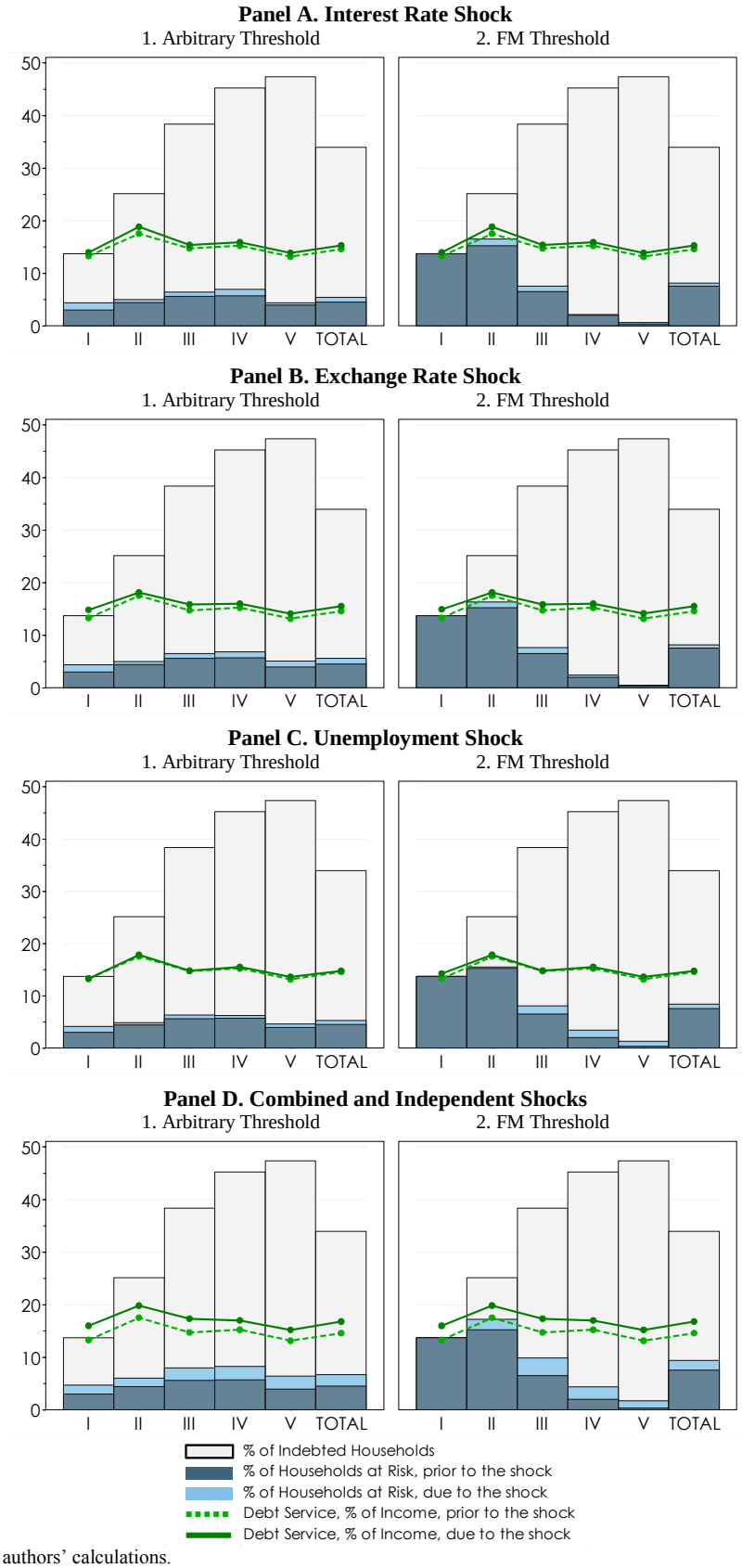
In Figure 5, the light blue part of each column represents the households that become vulnerable as a result of economic shocks. The first three 2-chart panels represent the referenced shocks in isolation. An exchange rate shock appears to have the largest impact when the arbitrary risk threshold is used and an unemployment shock has the largest impact under the financial margin threshold (i.e., the light blue section is the largest in each of these cases), though it should be recognized that (i) the difference is limited across each of the three shocks explored and (ii) the increase in household vulnerability as a result of these shocks does not appear to be too high.

More worryingly, low income quintiles are vulnerable even before any shock is applied. In fact, very few poor households are at risk as a result of an economic shock. In fact, most of them are *risk loans at origination*; this is in particular the case when the financial margin threshold is used to tag households as vulnerable. This raises questions as to what banks might know about their borrowers that is captured by the HBS. However, since the paper's focus is on household resilience as a result of the crisis, our primary focus is on "changes" in household vulnerability. These changes are less prone to biases arising from possible deficiencies in HBS.

Finally, the effect of combining all three shocks—the last 2-chart panel (Figure 5, Panel D)—is the exercise with the largest impact. Using the arbitrary threshold approach, 6.7 percent of all households (or 19.8 percent of households with debt) are vulnerable after a combined shock (left chart and Table 1).[13] The numbers rise when using the financial margin threshold; 9.4 and 27.7 percent, respectively. Still, only 1 out of 10 households are at risk; i.e., this is unlikely to constitute a drag on economic activity. Also, financial stability could be seen as a concern—20 to 28 percent of households with debt are at risk. However, two-thirds of these vulnerable households are at risk before an economic shock takes place—an upward bias that reflects problems with Croatia's HBS. In fact, new vulnerable households represent only between 5.4 and 6.4 percent of all households with debt; in other words, vulnerable households as a result of plausible economic shocks are unlikely to become a threat to the economic recovery.

[13] It should be noted that the exercise is conducted as independent shocks; that is, it is not necessarily the case that a household experiences concurrently all three economic shocks—changes in interest rates, a depreciation of the exchange rate, or a household member becoming unemployed are independent events.

Figure 5. Household Vulnerability after Economic Shocks



Source: Croatia HBS and authors' calculations.

Table 1. Household Vulnerability Before and After Economic Shocks

	No shocks		Combined shock				35% devaluation plus other shocks			
	Arbitrary threshold	Financial margin threshold	Arbitrary threshold		Financial margin threshold		Arbitrary threshold		Financial margin threshold	
			Level	Change	Level	Change	Level	Change	Level	Change
% of risk households relative to all HHs	4.6	7.6	6.7	2.2	9.4	1.8	8.2	3.6	10.3	2.7
% of risk households relative to indebted HHs	13.5	22.4	19.8	6.4	27.7	5.4	24.0	10.6	30.3	7.9

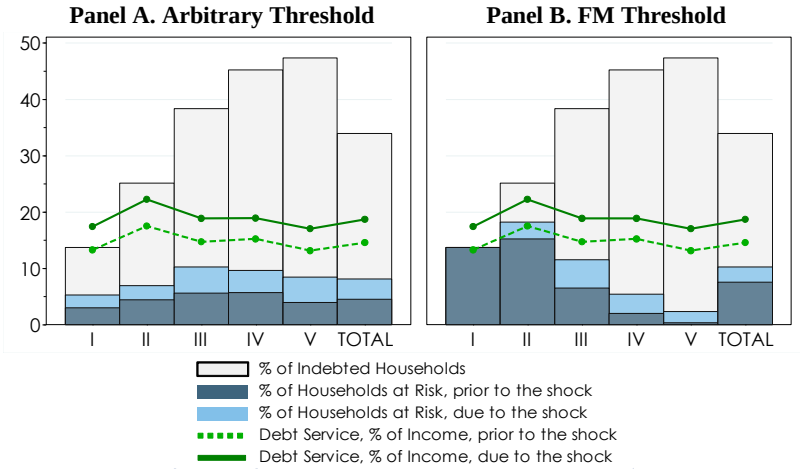
Source: Croatia HBS and authors' calculations.

A 35 Percent Devaluation in Addition to Interest and Unemployment Shocks

Perhaps the drawback of these calculations is that no meaningful devaluation takes place given Croatia's exchange rate regime choice and the more limited role of loans in Swiss francs as opposed to the case of other emerging European countries (e.g., Hungary). To address this drawback, an arbitrary nominal devaluation of 35 percent is imposed on top of the described shocks through increases in interest rates and the unemployment rate. The focus is only on first round effects; i.e., pass-through effects, including the effects on incomes, are not considered.

As shown in Figure 6 (and Table 1), a 35 percent devaluation (in combination with interest rate and unemployment shocks, and when using the arbitrary threshold to tag households as vulnerable) has a larger impact on household vulnerability. In fact, 3.6 percent of all households (an increase from 4.6 percent of all households before the shock to 8.2 percent after the shock) and 10.6 percent of households with debt (an increase from 13.5 to 24.0 percent among households with debt) become vulnerable as a result of such an economic shock. This is above the combined shock described in Figure 5, Panel D. And yet, even with such an arbitrary shock, the increase in vulnerability among households does not appear to be too large. [Using the financial margin threshold the corresponding increases are about 3 and 8 percent, respectively.[14]]

Figure 6. Household Vulnerability to a 35 Percent Devaluation



Source: Croatia HBS and authors' calculations.

[14] That fewer households are at risk when using the financial margin threshold reflects that rich households have more room to service their debt obligations and that poor households were at risk even before imposing an economic shock.

Financial Stability Implications

The last step is to calculate the implications of these stress tests for financial stability. The pertinent question is how important are vulnerable households for the loan portfolio of banks. The focus is no longer on the share of all households that are vulnerable (or the share of households with debt that are vulnerable), but on the total debt held by these households. Implicitly, it can be assumed that the loans held by vulnerable households will eventually enter into default. In this regard, the exposure to households (*EH*) is given by

$$EH = \frac{\sum_j p_j D_j}{\sum_j D_j}$$

where *p* denotes the probability of default and it is assumed that this probability equals 1 if a household is vulnerable and 0 otherwise, and *D* is the level of debt held by household *j*.

But this is an extreme case. It could well be the case that loan restructuring efforts might make these loans once again viable. As already noted, a large share of the debt held by vulnerable households is at risk at loan origination. Assets held by households, which are not captured in HBS, might serve to reduce the default risks faced by households.

More importantly, the recovery given default might lead to more nuanced conclusions regarding financial stability. Unlike other countries in emerging Europe, Croatia did not experience a sharp increase in real estate prices during the pre-crisis period (Figure 7); real estate prices have declined by about 22 percent from the peak reached back in 2007. It can thus be assumed that bank losses could be limited to about 20 percent of the debt value held by households. In this context, the loss given default (*LGD*) would be given by

$$LGD = \frac{\sum_j p_j (D_j - RE_j)}{\sum_j D_j}$$

where *p* again denotes the probability of default that equals 1 if a household is vulnerable and 0 otherwise, *D* is the level of debt held by household *j*, and *RE* is the value of real estate; it is assumed that $D > RE$ and that $RE = 0.8\ D_j$. Some caveats are needed, however. On the positive side, a loan-to-value ratio of 100 percent is implicitly assumed. In all likelihood this is too high, thus facilitating banks' recoveries on bad loans. On the negative side, losses given default in non real estate-related loans might be higher and, in addition, housing prices could enter a vicious declining path as NPLs rise—in particular if banks vigorously pursue foreclosure procedures.[15]

[15] A few caveats. The decline in housing prices shows a marked difference between price developments in the Adriatic coast and those that have taken place elsewhere within the country. Indeed, central bank data suggests that much of the decline since the 2008 peak has occurred in Zagreb. Also, as noted by Kraft (2007), ever-growing competition in the banking sector in the one or two years just before the global financial crisis points to, for example, increases in loan-to-value ratios. But these factors were short-lived and brought to an abrupt end by the crisis; i.e., they are likely to affect a small share of the outstanding household debt stock. Of greater concern might be the situation in commercial real estate, but this is not a subject examined in this paper.

Figure 7. Real Estate Prices in Croatia (2007=100)

Source: Global Property Guide and authors' calculations.

Notwithstanding these caveats, Table 2 shows the results on *EH* and the *LGD* using (i) the two different vulnerability thresholds described earlier as well as (ii) the different shock definitions discussed in this paper—a more likely combined shock (Figure 5, Panel D) and an arbitrary 35 percent devaluation that also includes interest rate and unemployment rate shocks (Figure 6).

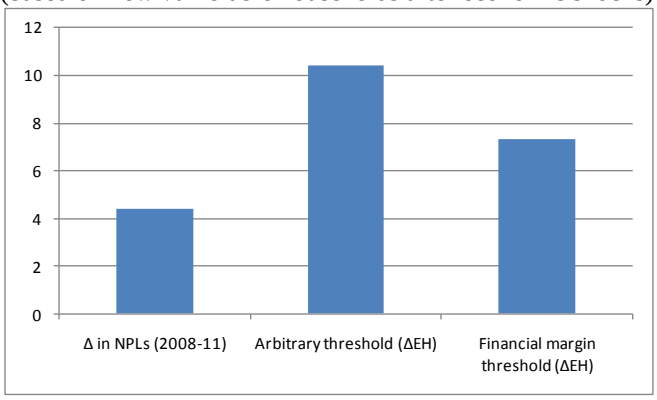
In conclusion, even though the increase in NPLs among Croatian households is a source of concern, it remains manageable given the country's well-capitalized banking sector. Risk loans relative to all banking system assets increase from about 8 to, at most, 12 percent. And the losses given default are even more limited: only 20 percent of these problem loans are likely to result in losses given the limited decline in housing prices; NPLs among households with debt are by themselves unlikely to constitute a threat for financial stability (i.e., losses of 2-2½ percent of all banking system assets). Also, only one-third of these losses are as a result of the shocks that followed from the global financial crisis. The remainder constitutes *risk loans at origination* that can be traced to weaknesses in the HBS—and these weaknesses have an impact on the levels, but not the change, of risk loans. Of course overall financial stability depends on developments throughout all asset classes, including developments in commercial real estate and corporate loans. But households by themselves are unlikely to constitute a threat to financial stability.

Table 2. Non-Performing Loans and Potential Bank Losses

	No shocks		Combined shock				35% devaluation plus other shocks			
	Arbitrary threshold	Financial margin threshold	Arbitrary threshold		Financial margin threshold		Arbitrary threshold		Financial margin threshold	
			Level	Change	Level	Change	Level	Change	Level	Change
EH (% of HH debt)	31.3	27.2	41.7	10.4	34.5	7.3	48.4	17.2	38.9	11.7
in % banking assets	8.8	7.7	11.8	2.9	9.7	2.1	13.6	4.8	11.0	3.3
in % GDP	11.6	10.1	15.4	3.9	12.8	2.7	17.9	6.3	14.4	4.3
LGD (% of HH debt)	6.3	5.4	8.3	2.1	6.9	1.5	9.7	3.4	7.8	2.3
in % banking assets	1.8	1.5	2.4	0.6	1.9	0.4	2.7	1.0	2.2	0.7
in % GDP	2.3	2.0	3.1	0.8	2.6	0.5	3.6	1.3	2.9	0.9

Source: Croatia HBS and authors' calculations.

Figure 8. Non-Performing Loans—Actual and Projected Changes
(based on new vulnerable households after economic shocks)



Source: Croatian National Bank, Croatia HBS and authors' calculations.

How do these financial stability risks compare with banking sector developments in Croatia? Figure 8 shows the change in NPLs among households since 2008 and until mid-2011, as well as the change in the total debt obligations among vulnerable households—*EH* using both risk thresholds and economic shocks that are likely in Croatia (i.e., those represented in Figure 5, Panel D). It can be concluded that reported NPLs are lagging what should be expected as a result of the crisis. While NPLs increased by 4½ percentage points, the new risk loans have increased by 7 to 10 percent of all household loans depending on the risk threshold used to tag households as vulnerable. The fact that NPL increases are lower should be expected as banks are less prone to recognize problem loans during hard times and regulatory authorities are more inclined towards regulatory forbearance. Still, the increase in problem loans is limited and not much of a risk for Croatia's well-capitalized banking sector.

Conclusions

Although a source of concern, the risks posed by household debts remain manageable. Only about 2 percent of all households (or about 6 percent of households with debt) are facing financial distress as a result of a combination of economic shocks (using an arbitrary threshold to tag households as vulnerable; Table 1). The concerns are even less pressing when the financial margin is used to tag households as vulnerable. These exercises do not assume a sharp change in the kuna-euro exchange rate. But calculations assuming a devaluation of 35 percent in the kuna-foreign currency exchange rate (in combination with interest rate and unemployment shocks in line with developments in 2007-10) suggest that even in such a case the additional households facing financial distress are not many; in the worst scenario only 4 percent of all households become vulnerable. In sum, household debt is unlikely to become a drag on aggregate economic activity given the low debt incidence levels among Croatian households. It should be noted that the analysis focuses on the first-round effects and, therefore, changes in income and growth, as well as subsequent losses in the banking sector, are not pursued. Still, we deem these to be limited on account of household debt. Other concerns exist, however, and these might negatively impact the banking sector (e.g., this paper does not examine risks originating in corporate debt nor the declines in growth that might follow from spillover effects originating in the eurozone).

In addition, banks are well-capitalized to address the challenges that arise from problem loans at the level of households. The risk loans rise by about 2.9 percent of all banking system assets

when an arbitrary threshold is used to tag households as vulnerable and following the combination of shocks described in Figure 5, Panel D. The increase is lower when the financial margin threshold and the same shocks are used—2.1 percent of all banking system assets.

What remains a puzzle is the large share of *risk loans at origination*; 8.8 percent of all banking system assets compared to a pre-crisis stock of NPLs among households of only 4.7 percent when an arbitrary threshold is used; and slightly lower when using the financial margin threshold (7.7 percent of banking system assets). Since banks chose to extend loans, the difference between NPLs and these *risk loans at origination* might reflect something banks know about their borrowers that is not captured in Croatia's 2008 HBS. In any event, financial distress among households arising from crisis-related economic shocks remains limited at an aggregate level; of course, our analysis precludes any comparison across individual banks.

What can governments do in the presence of over-indebted households? Financial distress not only has a negative social impact, but also overwhelms legal and institutional frameworks for debt restructuring. In this context, governments can help by facilitating private restructuring efforts. In the case of household debt, a tool applied with some success is known as the Bank of England pre-foreclosure protocol. The goal of such interventions is to facilitate out-of-court negotiations between creditors and debtors while avoiding distortions for them to perform in line with their contractual obligations. Discussions between creditors and debtors may include extending the term of debt, changing the type of debt instrument, or capitalizing arrears. Assessing borrowers' creditworthiness remains paramount and this should be left for banks to decide since they are better placed to judge a household's debt service capacity. Governments can complement this with consumer protection oversight rules to ensure a fair behavior on the part of creditors. They can also facilitate private debt restructuring efforts that are hampered by institutional arrangements, such as the tax and regulatory treatment of restructured loans.

What about a government program aimed at financially supporting households with debt obligations? As with any subsidy, government financial support should be limited, well-targeted, and adequately assess subsidy incidence. In this regard, government guarantees should be looked at carefully so as to avoid excessive costs and abuse, and fine tuned to a variety of scenarios—as to eligibility—in order to avoid the creation of unsustainable public sector liabilities. More importantly, the assumption that all households need to be compensated for the increase in debt service burden that arises from economic shocks is not justified by the distribution of indebted households across income quintiles. The case for debt relief interventions in Croatia with public financial support is, at this stage, not compelling: fiscal space for public financial support is limited, the social considerations for debt relief interventions funded with scarce public resources are not obvious, and the debtor and creditor moral hazard risks are significant.

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Appendix Table. Household Characteristics by Indebtedness, Croatia HBS 2008

	Arbitrary Threshold			Financial Margin Threshold			Household Indebtedness		
	Indebted Households		t-test	Indebted Households		t-test	All Households		t-test
	Vulnerable	Non-Vul.	(p-value)	Vulnerable	Non-Vul.	(p-value)	Indebted	No Debt	(p-value)
Number of Households									
Surveyed	141	913		241	813		1054	2054	
Weighted	65,882	423,640		109,626	379,897		489,522	951,678	
Household Income (Kuna)									
Disposable income	83,742	106,587	0.00	56,421	117,102	0.00	103,513	67,084	0.00
o/w Income from work	71,046	84,137	0.01	40,310	94,514	0.00	82,375	40,078	0.00
o/w Pensions	7,094	12,765	0.00	8,566	12,993	0.00	12,002	16,032	0.00
Household Expenditure (Kuna)									
Consumption expenditure	100,909	99,009	0.70	78,749	105,185	0.00	99,265	63,669	0.00
o/w Durable goods	9,495	8,532	0.65	4,127	9,970	0.00	8,661	2,859	0.00
Savings	434	1,382	0.00	1,179	1,276	0.89	1,255	1,874	0.20
Household Characteristics									
Household size	3.23	3.26	0.77	3.47	3.20	0.03	3.26	2.31	0.00
Evaluation of living standard [1=bad, …, 6=well]	3.26	3.48	0.10	2.70	3.66	0.00	3.45	3.19	0.00
Household Head:									
Female (%)	35.99	34.63	0.77	29.42	36.36	0.05	34.81	42.02	0.00
Age	47.56	49.25	0.15	50.09	48.71	0.20	49.02	58.56	0.00
Economically active (%)	77.61	76.75	0.83	65.54	80.13	0.00	76.87	48.19	0.00
Employed (%)	97.24	98.96	0.23	94.87	99.61	0.01	98.73	92.80	0.00
High-Skilled (%)	36.51	37.95	0.78	23.58	40.95	0.00	37.75	26.01	0.00
Tertiary education (%)	13.52	15.46	0.56	5.52	17.98	0.00	15.19	8.41	0.00
Possession of Consumer Durables (%)									
Car	83.44	78.62	0.18	67.77	82.58	0.00	79.27	47.25	0.00
Second Car	15.85	20.04	0.22	9.65	22.31	0.00	19.47	8.07	0.00
TV	99.44	99.60	0.79	99.58	99.58	1.00	99.58	96.24	0.00
Stereo	55.57	50.06	0.24	45.81	52.24	0.09	50.80	32.64	0.00
HI-FI	14.65	14.35	0.93	10.14	15.61	0.03	14.39	6.87	0.00
DVD	68.80	63.05	0.19	54.23	66.59	0.00	63.82	30.40	0.00
Personal Computer	61.79	56.13	0.22	48.95	59.18	0.01	56.89	26.69	0.00
Air Conditioner	32.26	27.16	0.24	17.12	30.94	0.00	27.84	21.22	0.00
Refrigerator	98.73	99.27	0.57	99.27	99.17	0.88	99.19	97.39	0.00
Microwave Oven	44.23	47.49	0.48	38.50	49.51	0.00	47.05	26.07	0.00

Note: "High-Skilled" includes occupations classified in Major Groups 1 to 3 in the International Standard Classification of Occupations: (i) legislators, senior officials and managers, (ii) professionals, and (iii) technicians and associate professionals.
Source: Croatia HBS; authors' calculations.